GI 101 Model Solutions
November 2025

1. Learning Objectives:

6. The candidate will understand how to apply the fundamental ratemaking techniques of general insurance.

Learning Outcomes:

(6h) Demonstrate the use of credibility in ratemaking

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapter 32.

Commentary on Question:

This question tests the candidate's understanding of the weights to assign for each year for ratemaking purposes, including the use of credibility in ratemaking.

Solution:

(a) Recommend the weights to assign to each year when estimating the weighted average trended claim ratio for the indicated rate change. Justify your recommendation.

Commentary on Question:

Alternative approaches are acceptable.

Since the total counts are less than the full credibility standard, all years should be included. Base weights off earned exposure distribution with rebalancing so that older years are not weighted more than more recent years.

Accident Year	Ultimate Counts	Earned Exposures	Running Total Ultimate Counts	Years to Include	Initial Weight	Limited Weight	Balanced
2021	171	11,064	1,009	Y	17.1%	17.1%	17.2%
2022	186	12,334	838	Y	19.1%	19.1%	19.1%
2023	220	12,329	652	Y	19.1%	19.1%	19.1%
2024	215	14,576	432	Y	22.5%	22.2%	22.3%
2025	217	14,391	217	Y	22.2%	22.2%	22.3%
	1009	64,694			100.0%	99.7%	100.0%

1. Continued

(b) Calculate the credibility assigned to the experience using the square root rule associated with classical credibility.

$$\text{credibility} = \sqrt{\frac{1,009}{1,082}} = 96.6\%$$

(c) Describe two options for the complement of credibility.

Any two of the following are acceptable.

- Current rates (or current claim ratio) trended to the forecast period
- Insurer's experience in other jurisdictions adjusted for differences in the mix of business or expected costs
- Industry experience adjusted to reflect the insurer's mix of exposure

2 Learning Objectives:

1. The candidate will understand the key considerations for and key concepts underlying general insurance actuarial work.

3. The candidate will know how to calculate and evaluate projected ultimate values.

Learning Outcomes:

(1d) Understand the components of ultimate values
(3c) Identify the types of development triangles that can be used for investigative testing
(3d) Analyze development triangles for investigative testing
(3e) Describe the key assumptions underlying the following projection methods: development method, frequency-severity methods, expected method, Bornhuetter Ferguson method, Benktander method, Cape Cod method, Generalized Cape Cod, and Berquist-Sherman adjustments to the development method
(3f) Demonstrate knowledge of good practice related to projecting ultimate values
(3g) Estimate ultimate values using the methods cited in (e)

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 3, 14, and 15.

Commentary on Question:

This question tests the candidate's understanding of the development method of estimating IBNR as well as understanding how changes such as a change in case adequacy and changes in the rate of claim settlement can affect development patterns.

Solution:

(a) Describe one advantage and one disadvantage of using the paid development method rather than the reported development method.

Commentary on Question:

Other advantages and disadvantages are possible.

Advantages:

- Paid development patterns are not influenced by changes in philosophy or processes regarding case estimates.
- Paid data often reflects the insurer's true settlement behavior more reliably.

Disadvantages:

- The volume of reported claims tends to be greater than the volume of paid claims, so the use of paid claims could end up with less credibility.
- The paid method is affected by changes in claim settlement patterns.

2. Continued

(b) Describe two possible reasons for the observed pattern of change down the 12-month column.

Accident	Ratios of Paid to Reported Claims					
Year	12	24	36	48	60	72
2019	0.572	0.748	0.839	0.935	0.992	1.000
2020	0.581	0.762	0.862	0.934	0.992	
2021	0.590	0.768	0.870	0.944		
2022	0.599	0.772	0.883			
2023	0.603	0.788				
2024	0.615					

Ratios are increasing down the 12-month column.

Possible reasons:

- possible change (settling claims faster) in claim settlement pattern over time
- possible change in case adequacy (reduction) over time

Commentary on Question:
Possible reasons need to be specific about the change. For example, noting there could be a change in claim settlement pattern is only partially correct. The change that would lead to the pattern in this data is settling claims faster.

(c) Calculate the IBNR for AY 2024 as of December 31, 2024 using the paid development method and the original Bondy method as the tail factor. Justify any selections you make.

	Age-to-Age Development Factors					
AY	12-24	24-36	36-48	48-60	60-72	
2019	1.525	1.259	1.165	1.117	1.036	
2020	1.515	1.255	1.162	1.111		
2021	1.510	1.256	1.159			
2022	1.516	1.244				
2023	1.512					
Avg-All years	1.516	1.254	1.162	1.114	1.036	Tail
Avg-Weighted all	1.515	1.253	1.162	1.114	1.036	(Bondy)
Selected	1.516	1.254	1.162	1.114	1.036	1.036
Age-to-Ultimate	2.642	1.743	1.391	1.197	1.074	1.036

2. Continued

Due to the stability in the development, both simple average and weighted averages values are reasonable. Weighted average values were selected.

AY	Cumulative Paid Claims	CDF	Ultimate Claims	Reported Claims	IBNR
2024	3,725,398	2.642	9,843,217	6,055,138	3,788,079

(d) Assess the appropriateness of using the paid development method to estimate IBNR in this situation.

- The paid development factors are essentially stable in each development period.
- There is low leverage in the age to ultimate development factors, so the paid development method is appropriate from a leverage perspective.
- From part (b), it is possible change there is a change in claim settlement pattern that would affect the appropriateness of the paid development method.
- Overall, this method is appropriate if there has not been a change in claim settlement pattern and likely not appropriate if there has been a change in claim settlement pattern.

(e) Recommend another investigative test to improve your IBNR analysis, assuming you have additional data as needed. Justify your recommendation.

Commentary on Question:
Some candidates recommended an alternative method. While an alternative method may be helpful, this question asks for a different investigative test and not a different method.

Either of the following recommendations are acceptable:

- Analyze a triangle of average reported claims (or average case estimates) to see if there is a similar pattern in the 12 month column.
- This could help determine if pattern in paid to reported ratios could be caused by a potential change in case adequacy.

OR

- Analyze a triangle of closed to reported counts to see if there is a similar pattern to the paid to reported claims triangle.
- This could help determine if pattern in paid to reported ratios could be caused by a potential change in settlement.

3. Learning Objectives:

6. The candidate will understand how to apply the fundamental ratemaking techniques of general insurance.

Learning Outcomes:

(6c) Explain the requirements for loadings for catastrophes and large claims in ratemaking

(6d) Calculate loadings for catastrophes and large claims

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 27 and 30.

Commentary on Question:

This question tests the candidate's understanding of determining a wildfire loading used for ratemaking.

Solution:

(a) Describe how the occurrence of catastrophe events affects the frequency and severity of an insurance company's total claims.

Frequency:

- An event that is declared a catastrophe is expected to result in a substantial number of GI claims for the insurers providing coverage in the area of the catastrophe.
- Therefore, total frequency will see an increase.

Severity:

- A catastrophe event could either result in many claims that are larger than the non-catastrophe severity (e.g., from an earthquake), or many claims that are smaller than the non-catastrophe severity (e.g., hail damage to vehicles).
- Therefore, total severity could either be lower or higher depending on the event.

(b) Describe how the occurrence of large claims affects the frequency and severity of an insurance company's total claims.

Frequency:

- Large claims are generally infrequent and would therefore have little to no effect on frequency.

Severity:

- Large claims would by definition be much larger and therefore increase severity.

3. Continued

(c) Calculate the wildfire loading as a claim ratio.

Accident Year	(1) Earned House Years (EHY)	(2) Wildfire Ultimate Counts	(3) Wildfire Ultimate Claims	Experience Period	Forecast Period	(4) Trending Period (months)
2015	21,923	1	350,000	Jul. 1, 2015	Apr. 1, 2027	141
2016	22,270	0	0	Jul. 1, 2016	Apr. 1, 2027	129
2017	22,724	0	0	Jul. 1, 2017	Apr. 1, 2027	117
2018	23,127	2	1,210,000	Jul. 1, 2018	Apr. 1, 2027	105
2019	23,503	0	0	Jul. 1, 2019	Apr. 1, 2027	93
2020	23,901	0	0	Jul. 1, 2020	Apr. 1, 2027	81
2021	24,179	0	0	Jul. 1, 2021	Apr. 1, 2027	69
2022	24,433	3	760,000	Jul. 1, 2022	Apr. 1, 2027	57
2023	24,752	0	0	Jul. 1, 2023	Apr. 1, 2027	45
2024	25,392	4	900,000	Jul. 1, 2024	Apr. 1, 2027	33
Total	236,204	10	3,220,000			

Accident Year	(5) = $(1.07)^{[(4)/12]}$ Severity Trend @ 7%	(6) = (3)(5) Trended Wildfire Ultimate Claims
2015	2.2144	775,046
2016	2.0695	0
2017	1.9342	0
2018	1.8076	2,187,225
2019	1.6894	0
2020	1.5788	0
2021	1.4756	0
2022	1.3790	1,048,061
2023	1.2888	0
2024	1.2045	1,084,046
Total		5,094,378

Trended pure premium for wildfire claims = 5,094,378 / 236,204	21.568
Calendar Year (CY) 2024 EHY	25,392
Wildfire expected claims = 21.568 × 25,392	547,647
2024 trended earned premium at current level	17,500,000
Wildfire loading as a claim ratio = 547,647 / 17,500,000	3.13%

4. Learning Objectives:

2. The candidate will demonstrate the ability to prepare claims and exposure data for general insurance actuarial work.

Learning Outcomes:

(2b) Describe the different types of exposures used for conducting actuarial work

(2c) Calculate written, earned, in-force and unearned premiums for portfolios of policies with various policy terms and earnings patterns

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapter 12.

Commentary on Question:

This question tests the candidate's understanding of written and earned premiums.

Solution:

(a) Calculate the calendar year 2024 written premiums for the policies that renewed in 2024.

Commentary on Question:

Some candidates adjusted for the premium change by doing on-level adjustment. On-level adjustment applies to earned premiums and not written premiums. This part is about written premiums, so only the rate increase is needed and not an on-level adjustment.

# of policies renewed in 2024 before July 1, 2024: 5,600×0.95×0.5 =	2,660
Annual premium for each policy renewed before July 1, 2024	1,200
2024 WP for policies renewed before July 1, 2024	3,192,000
# of policies renewed in 2024 on or after July 1, 2024	2,660
Annual premium for each policy renewed on or after before July 1, 2024	1,260
2024 WP for policies renewed on or after July 1, 2024	3,351,600
Total 2024 WP	6,543,600

4. Continued

(b) Calculate the calendar year 2024 written premiums for the new policies written in 2024.

# of policies written in 2024 before July 1, 2024: 900×0.5 =	450
Annual premium for each policy written before July 1, 2024	1,200
2024 WP for policies renewed before July 1, 2024	540,000
# of policies written in 2024 on or after July 1, 2024	450
Annual premium for each policy written on or after before July 1, 2024	1,260
{same for all policies regardless of whether they are written for 12-month or 6-month policy terms}	
2024 WP for policies renewed on or after July 1, 2024	567,000
Total 2024 WP	1,107,000

(c) Explain whether the CY 2024 on level factors would be higher or lower if 50% of the policies written in 2024 were written for 6-month policy terms.

Because of the change, more of the premiums would be earned at the higher rate level in 2024 than would have been earned had they all been written for 12-month policies.

Therefore, the on level factor would have been lower.

5. Learning Objectives:

4. The candidate will understand financial reporting of claim liabilities and premium liabilities.

Learning Outcomes:

(4a) Describe the key assumptions underlying ratio and count-based methods for estimating unpaid unallocated loss adjustment expenses

(4b) Estimate unpaid unallocated loss adjustment expenses using ratio and count-based methods

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapter 23.

Commentary on Question:

This question tests the candidate's understanding of estimating unpaid ULAE using a count-based method.

Solution:

(a) Describe two major drawbacks of ratio-based methods that are likely resolved by count-based methods.

The first drawback is that ratio-based methods do not recognize the fact that the amount of ULAE does not depend solely on the magnitude of the total claims in the portfolio.

The second drawback is that the unpaid ULAE determined using ratio-based methods will fluctuate in response to changes in the estimates of unpaid claims.

(b) Recommend an average ULAE per weighted count. Justify your recommendation.

		Counts				Avg ULAE	Trending	Trend to	Avg ULAE
Calendar Year	Paid ULAE	Newly Reported	Open	Closed	Weighted Total	Per Weighted Count	Period in Years	2025 at 3.0%	Trended to 2025
2021	359,580	1,180	866	1,064	999.80	359.65	4	1.1255	404.79
2022	369,300	904	870	900	886.20	416.72	3	1.0927	455.36
2023	373,500	860	892	838	871.60	428.52	2	1.0609	454.62
2024	393,900	870	920	842	889.40	442.88	1	1.0300	456.17
Selected Weights		30%	50%	20%					
Recommended average ULAE per weighted count									455.38

Justification: 2021 appears to be an outlier, so use average of 2022 to 2024.

5. Continued

(c) Calculate the unpaid ULAE as of December 31, 2024.

Calendar Year	Counts: Newly Reported	Counts: Open	Counts: Closed	Weighted Total	Trending Period in Years	Trend from 2025 at 3.0%	Trended Average ULAE	Estimated Unpaid ULAE
2025	238	610	548	486.00	0	1.0000	455.38	221,317
2026	99	339	370	273.20	1	1.0300	469.05	128,143
2027	35	204	170	146.50	2	1.0609	483.12	70,777
2028	0	76	128	63.60	3	1.0927	497.61	31,648
2029	0	0	76	15.20	4	1.1255	512.54	7,791
Total								459,675

6. Learning Objectives:

2. The candidate will demonstrate the ability to prepare claims and exposure data for general insurance actuarial work.

3. The candidate will know how to calculate and evaluate projected ultimate values.

Learning Outcomes:

(2d) Adjust historical earned premiums to current rate levels
(3f) Demonstrate knowledge of good practice related to projecting ultimate values
(3g) Estimate ultimate values using the methods cited in (e)

Sources:

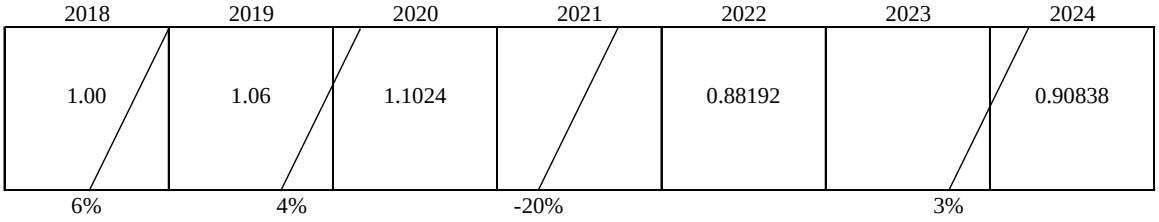
Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 13 and 17.

Commentary on Question:

This question tests the candidate's understanding of adjusting earned premiums to current rate levels as well as estimating ultimate claims using the expected method.

Solution:

(a) Calculate premium on-level factors to use for projecting ultimate claims as of December 31, 2024, for accident years 2018 through 2024.



Date	Rate Level Index	% of premium earned in CY 2018	2019	2020	2021	2022	2023	2024
Prior to July 1, 2018	1.000000	75.00%						
Jul. 1, 2018	1.060000	25.00%	88.89%	2.78%				
Sep. 1, 2019	1.102400		11.11%	97.22%	50.00%			
Apr. 1, 2021	0.881920				50.00%	100.00%	88.89%	2.78%
Sep. 1, 2023	0.908378						11.11%	97.22%
Total		100%	100%	100%	100%	100%	100%	100%
Average rate level		1.0150	1.0647	1.1012	0.9922	0.8819	0.8849	0.9076
On level factor for reserving		0.8942	0.8525	0.8242	0.9148	1.0292	1.0257	1.0000

e.g., CY2019 at 1.1024 rate index level: % of premium earned = ½ × 4/12 × 8/12 = 11.11%
CY2019 at 1.06 rate index level: % of premium earned = ½ × 4/12 × 2/12 = 2.78%

6. Continued

(b) Recommend a 2024 cost level expected claim ratio using the expected method. Justify your recommendation.

Commentary on Question:
Many candidates incorrectly calculated the 2021 tort reform adjustment factor as 0.75×1.0 + 0.25×0.8 = 0.95 instead of the correct answer of 0.25×1.0 + 0.75×0.8 = 0.85.

Accident Year	Earned Premiums	Ultimate Claims as of Dec. 31, 2024	Claim Adjustment Factors		On Level Factors	Trended On Level Claim Ratio
			Claim Trend @ 5.00%	Tort Reform		
2018	9,956,743	6,574,878	1.34010	0.80	0.8942	79.2%
2019	10,331,409	6,997,575	1.27628	0.80	0.8525	81.1%
2020	10,990,536	7,031,623	1.21551	0.80	0.8242	75.5%
2021	11,548,428	6,368,826	1.15763	0.85	0.9148	59.3%
2022	9,409,209	6,676,849	1.10250	1.00	1.0292	76.0%
2023	9,876,766	7,378,658	1.05000	1.00	1.0257	76.5%
2024	10,286,627	7,581,748	1.00000	1.00	1.0000	73.7%

Average trended on level claim ratio at AY2024 cost and rate level (excluding 2024)

All Years	74.6%
Latest 5 Years	73.7%
Latest 6 Years Excluding High and Low	76.8%
Latest 3 Years	70.6%
Selected	76.8%

Justification: All years average excluding high and low values to smooth out the fluctuations, especially 2021.

(c) Calculate the accident year ***2020*** expected claims.

Claim ratio at AY2020 level: 76.8%×0.8242/(1.21551×0.80) = 65.08%

Expected claims for AY2020: 65.08%×10,990,536 = 7,153,005

7. Learning Objectives:

3. The candidate will know how to calculate and evaluate projected ultimate values.

5. The candidate will understand trending procedures as applied to ultimate claims, exposures and premiums.

Learning Outcomes:

(3g) Estimate ultimate values using the methods cited in (e)
(5c) Analyze and evaluate trend for claims (including frequency, severity, and pure premium) and exposures (including inflation-sensitive exposures and premiums)
(5d) Choose trend rates for claims (frequency, severity, and pure premium) and exposures
(5e) Calculate trend factors for claims and exposures

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 16 and 26.

Commentary on Question:

This question tests the development-based frequency-severity method of estimating ultimate claims.

Solution:

(a) Recommend an annual frequency trend for use with the development-based frequency-severity method. Justify your recommendation.

Accident Year	Claim Frequency	(1) Case Law Change Adjustment Factor	(2) Adjusted Frequency	Annual Change in Frequency
2018	5.11%	1.10	5.62%	
2019	5.00%	1.10	5.50%	–2.11%
2020	4.93%	1.10	5.42%	–1.53%
2021	5.49%	1.00	5.49%	1.26%
2022	5.46%	1.00	5.46%	–0.47%
2023	5.37%	1.00	5.37%	–1.69%
2024	5.32%	1.00	5.32%	–0.86%
	Average:	All years		–0.90%
		Excl. hi-lo		–1.14%
		Fitted exponential:		–0.73%
		All years excl. 2021		–1.33%
		Selected:		–1.33%

7. Continued

Justification: Average of all years with removing the 2021 due to the effect of the caselaw change.

(b) Calculate the ultimate counts for all accident years using the development-based frequency-severity method and your recommendation from part (a).

Accident Year	(2) Adjusted Frequency	(3) Frequency Trend Factors	(4) = (2)(3) Trended Adjusted Frequency	(5) = (A) / [(1)(3)] Calculated Ultimate Counts
2018	5.62%	0.92270	5.19%	774.37
2019	5.50%	0.93515	5.15%	782.59
2020	5.42%	0.94778	5.14%	788.38
2021	5.49%	0.96057	5.27%	856.06
2022	5.46%	0.97354	5.32%	859.82
2023	5.37%	0.98668	5.30%	858.84
2024	5.32%	1.00000	5.32%	853.76
				5,773.82

Average trended frequencies at 2024 cost level excluding 2024

All years	5.23%	
Excl hi-lo	5.26%	
Average 2021-2023	5.30%	
Selected frequency at 2024 cost level	**5.30%**	(A)

Justification: Exclude 2024 per the method. There is an increasing trend, so use just the most recent 3 years to reflect the higher frequency.

7. Continued

(c) Calculate the ultimate claims as of December 31, 2024 for all accident years using the development-based frequency-severity method and the ultimate counts from part (b).

Accident Year	(6) Severity Trend Factors @ 7%	(7) = 12,400 / (6) Calculated Ultimate Severity	(5) Ultimate Counts	(8) = (5)(7) Ultimate Claims
2018	1.50073	8,262.64	774.37	6,398,356
2019	1.40255	8,841.03	782.59	6,918,884
2020	1.31080	9,459.90	788.38	7,458,019
2021	1.22504	10,122.09	856.06	8,665,141
2022	1.14490	10,830.64	859.82	9,312,347
2023	1.07000	11,588.79	858.84	9,952,924
2024	1.00000	12,400.00	853.76	10,586,570
				59,292,241

8. Learning Objectives:

2. The candidate will demonstrate the ability to prepare claims and exposure data for general insurance actuarial work.

3. The candidate will know how to calculate and evaluate projected ultimate values.

Learning Outcomes:

(2a) Create development triangles of claims and counts from detailed claim transaction data

(3e) Describe the key assumptions underlying the following projection methods: development method, frequency-severity methods, expected method, Bornhuetter Ferguson method, Benktander method, Cape Cod method, Generalized Cape Cod, and Berquist-Sherman adjustments to the development method

(3f) Demonstrate knowledge of good practice related to projecting ultimate values

(3g) Estimate ultimate values using the methods cited in (e)

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 11 and 20.

Commentary on Question:

This question tests the candidate's ability to create a claims development triangle from claims transaction data as well as estimating ultimate claims using Berquist-Sherman adjustments when there has been a change in case reserve adequacy.

Solution:

(a) Revise the AY 2022 rows for the reported claims and cumulative paid triangles to remove the large claims.

Case Estimates for Large Claims

Claim	12	24	36
#1	350,000	550,000	550,000
#2	0	570,000	850,000
Total	350,000	1,120,000	1,400,000

Cumulative Paid Claims for Large Claims

Claim	12	24	36
#1	0	150,000	200,000
#2	0	0	0
Total	0	150,000	200,000

8. Continued

Reported Claims for Large Claims

AY	12	24	36
2022	350,000	1,270,000	1,600,000

Revised triangles to remove the large claims:

Adjusted Reported Claims

AY	12	24	36
2022	4,546,994	6,029,550	7,409,520

Adjusted Cumulative Paid Claims

AY	12	24	36
2022	2,408,832	4,247,287	5,934,142

(b) Revise the AY 2022 rows for the reported counts and closed counts triangles to remove the large claims.

Reported Counts for Large Claims

AY	12	24	36
2022	1	2	2

Closed Counts for Large Claims

AY	12	24	36
2022	0	0	0

Adjusted Reported Counts

AY	12	24	36
2022	742	878	982

Adjusted Closed Counts

AY	12	24	36
2022	444	648	808

8. Continued

(c) Calculate the AY 2022 reported claims for all maturity ages with an adjustment for case reserve strengthening, using the the Berquist-Sherman adjustment for a change in case adequacy.

Accident	Average Case Estimates with Adjustment for Case Strengthening					
Year	12	24	36	48	60	72
2019	6,610.61	7,100.24	7,059.18	6,852.97	5,518.21	*874.25*
2020	7,027.08	7,547.55	7,503.91	7,284.71	*5,865.86*	
2021	7,469.79	8,023.05	7,976.65	*7,743.64*		
2022	***7,940.38***	***8,528.50***	***8,479.18***			
2023	8,440.63	*9,065.80*				
2024	*8,972.39*					

Accident	Open Counts		
Year	12	24	36
2022	298	230	174

Accident	Reported Claims with Adjustment for Case Strengthening					
Year	12	24	36	48	60	72
2022	4,775,067	6,208,843	7,409,520			

(d) Calculate the AY 2022 ultimate claims.

Commentary on Question:
Some candidates used the development method to calculate and select their own development factors instead of using the age-to-ultimate development factors as given in the question. This was not necessary but an acceptable alternative as long as the selections were reasonable.

AY2022 reported claims without large claims	7,409,520
36 to ultimate development factor (given value)	1.347
Ultimate claims excluding large claims	9,980,623
Reported claims for large claims	1,600,000
Total AY2022 ultimate claims	11,580,623

9. Learning Objectives:

3. The candidate will know how to calculate and evaluate projected ultimate values.

Learning Outcomes:

(3e) Describe the key assumptions underlying the following projection methods: development method, frequency-severity methods, expected method, Bornhuetter Ferguson method, Benktander method, Cape Cod method, Generalized Cape Cod, and Berquist-Sherman adjustments to the development method

(3g) Estimate ultimate values using the methods cited in (e)

(3i) Assess the appropriateness of the projection methods cited in (e) in varying circumstances

(3j) Evaluate and justify selections of ultimate values based on the methods cited in (e)

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 19 and 21.

Commentary on Question:

This question tests the candidate's understanding of certain changing conditions and also calculating unpaid claims using the Generalized Cape Cod method.

Solution:

(a) Recommend an approach to estimate accident year (AY) 2024 ultimate claims for line of business A. Justify your recommendation.

Commentary on Question:

Either of the following two possible answers is acceptable. There are other possible methods that are acceptable with appropriate justification.

1. Berquist-Sherman adjustment to case estimates with development method:
    - Adjust case estimates for the change in case adequacy
    - Determine new reported claims then use development method on adjusted reported claims to estimate ultimate claims
    - Justification: This line of business is stable, so development method is appropriate to use on adjusted reported claims.
2. Paid development method:
    - The paid development is not affected by case change, so this method is appropriate.
    - However, as this is a long-tailed line of business, we need to be aware of possible high leverage that might make this method inappropriate/less desirable.
    - Justification: This line of business is stable, so the development method is appropriate as long as the leverage is not too high.

9. Continued

(b) Recommend an approach to estimate AY 2024 ultimate claims for line of business B. Justify your recommendation.

Commentary on Question:
Either of the following two possible answers is acceptable. There are other possible methods that are acceptable with appropriate justification.

1. Berquist-Sherman adjustment for claim settlement change with the development method:
    - Adjust paid claims for the change in claim settlement.
    - Determine the new paid claims and estimate ultimate claims using the development method.
    - Justification: This line of business is stable, so the development method is appropriate with adjusted paid claims. Leverage should not be a concern as this is a short-tailed line of business.
2. Reported development method:
    - Reported claims are not affected by claim settlement change, so this method is appropriate to use
    - The development method is appropriate for short-tailed stable lines of business.
    - Justification: This line of business is stable, so the development method is appropriate.

(c) Describe one reason why a low decay factor would be appropriate for line of business C.

The greater the confidence in the development method, the smaller the decay factor should be.

(d) Calculate the ***AY 2020*** expected claim ratio adjusted to the 2024 level using the Generalized Cape Cod method.

Accident Year	Trend Factors	Used-Up On-Level Earned Premiums	Adjusted Claims as of Dec. 31, 2024	Claim Ratio	Decay Factors for AY 2020
2019	1.30696	12,639,915	9,881,829	78.18%	50.0%
2020	1.23882	12,343,174	9,647,773	78.16%	100.0%
2021	1.17424	11,533,089	9,030,099	78.30%	50.0%
2022	1.11303	10,170,771	8,246,981	81.09%	25.0%
2023	1.05500	8,581,640	6,886,586	80.25%	12.5%
2024	1.00000	6,541,818	5,514,933	84.30%	6.3%
2024 level expected claim ratio for AY 2020:				78.62%	

9. Continued

(e) Calculate the ***AY 2023*** ultimate claims using the Generalized Cape Cod method.

AY 2023 expected claim ratio at AY 2023 cost level:	
80.6%×1.023/1.055 =	0.78155
AY 2023 expected claims from GCC method:	
13,723,913×0.78155 =	10,725,960
AY 2023 GCC ultimate claims:	
6,527,570 + 10,725,960×(1 – 1/1.636) =	10,697,320

10. Learning Objectives:

3. The candidate will know how to calculate and evaluate projected ultimate values.

Learning Outcomes:

(3f) Demonstrate knowledge of good practice related to projecting ultimate values
(3g) Estimate ultimate values using the methods cited in (e)
(3j) Evaluate and justify selections of ultimate values based on the methods cited in (e)

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 18 and 22.

Commentary on Question:

This question tests the candidate's understanding of estimating ultimate and unpaid allocated loss adjustment expenses (ALAE) using the development method, the Bornhuetter Ferguson method, and the Benktander method.

Solution:

(a) Describe two advantages that blended methods provide when evaluating and selecting estimates of ultimate claims.

Any two of the following are acceptable:

- The Bornhuetter Ferguson and Cape Cod methods are easy to apply and relatively easy to explain to non-actuarial users
- Blending expected claims with actual claims is intuitively appealing; as a year matures, more weight will be given to actual claims instead of expected claims
- Because future claim emergence is tied to exposures instead of historical claim experience, external information can be readily incorporated into the analysis.

(b) Calculate the ultimate ALAE for all accident years using the Bornhuetter Ferguson (BF) method.

Accident Year	Development Method CDFs	BF Method Ratios	BF Estimate Ultimate ALAE
2020	1.0323	0.1588	1,356,727
2021	1.0816	0.1561	1,428,753
2022	1.1938	0.1485	1,482,259
2023	1.3853	0.1424	1,520,424
2024	1.7294	0.1356	1,633,850
Total			7,422,011

10. Continued

(c) Calculate the ultimate ALAE for all accident years using 1 iteration of the Benktander method.

Accident Year	Benktander Method Ratios	Benktander Ultimate ALAE
2020	0.1600	1,367,076
2021	0.1588	1,453,667
2022	0.1531	1,528,414
2023	0.1486	1,586,891
2024	0.1422	1,713,182
		7,649,230

(d) Explain whether this alternative approach would give a higher or lower value than the estimate of ultimate ALAE determined in part (b).

Ratios are decreasing over time. This means that claims are increasing at a higher rate than ALAE. If ALAE was included with claims, they would be overstated.

11. Learning Objectives:

5. The candidate will understand trending procedures as applied to ultimate claims, exposures and premiums.

6. The candidate will understand how to apply the fundamental ratemaking techniques of general insurance.

Learning Outcomes:

(5c) Analyze and evaluate trend for claims (including frequency, severity, and pure premium) and exposures (including inflation-sensitive exposures and premiums)
(5d) Choose trend rates for claims (frequency, severity, and pure premium) and exposures
(5e) Calculate trend factors for claims and exposures
(6a) Quantify different types of expenses required for ratemaking including expense trending procedures

Sources:

Fundamentals of General Insurance Actuarial Analysis, Second Edition (2022), J. Friedland, Chapters 27 and 30.

Commentary on Question:

This question tests the candidate's understanding of expenses used for ratemaking, including trending of fixed expenses.

Solution:

(a) Describe whether a separate trending process might be needed for fixed expenses for the following exposures:.

(i) Payroll

(ii) Number of vehicles

(i) Payroll: inflation sensitive, so if fixed expenses trend similar to payroll, then separate trending procedure may not be required.

(ii) Number of vehicles: exposures are not inflation-sensitive, so would need to conduct separate trending procedures for the fixed expenses.

11. Continued

(b) Recommend an annual premium trend for this line of business. Justify your recommendation.

Accident Year	On Level Earned Premiums Per Exposure	Year to Year Change in On Level Earned Premiums Per Exposure	
2019	1,287.35		
2020	1,272.40	-1.16%	
2021	1,285.90	1.06%	
2022	1,292.36	0.50%	
2023	1,280.71	-0.90%	
2024	1,304.72	1.88%	
Fitted:	0.262%	0.275%	:Average

Selected: 0.275%
Justification: All years average is selected due to the volatility.

(c) Calculate the trended fixed expense ratios to premiums for all accident years.

Accident Year	Trend Period (years)	Premium Trend Factors	Trended Earned Premiums at Current Rates	Fixed Expense Trend Factors	Trended Fixed Expenses	Trended Fixed Expense Ratio
2019	6.75	1.01872	12,524,328	1.06947	683,713	5.46%
2020	5.75	1.01592	12,874,846	1.05888	702,910	5.46%
2021	4.75	1.01313	13,255,897	1.04840	724,143	5.46%
2022	3.75	1.01035	13,789,979	1.03802	746,513	5.41%
2023	2.75	1.00758	13,995,868	1.02774	768,655	5.49%
2024	1.75	1.00482	14,578,456	1.01757	792,496	5.44%